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ABSTRACT

A study was conducted to develop and field test a greenhouse production record book and unit of instruction for growing potted chrysanthemums. Twenty high schools in Pennsylvania with horticulture departments formed the population for the study. The twenty schools were randomly assigned to four treatment levels: (1) five classes received the greenhouse record book coupled with the potted-chrysanthemum units, (2) five classes received only the greenhouse record book, (3) five classes received only the potted-chrysanthemum unit, and (4) five classes received the teacher's own instructional materials. Based on mean crop quality scores and mean test scores it was concluded that the teaching unit was effective in promoting cognitive learning about potted-chrysanthemum production. The results supported the belief that the students who received the teaching unit would score higher on a cognitive test than students who did not receive the unit. The potted-chrysanthemum unit and the greenhouse record book, when used independently, were effective in helping students to grow higher quality potted chrysanthemums. (The production record book and the evaluation test are appended.) (LRA)

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Final Report

Field Testing of the Greenhouse Production Section of a Horticulture Laboratory Record Book for Pennsylvania

Contract No. 93-0003

Kenneth B. Rhodes

The Pennsylvania State University
University Park, Pennsylvania 16802

September 30, 1980

Pennsylvania Department of Education
Bureau of Research and Evaluation
Research Coordinating Unit
for Vocational Education

CE 026 832

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1. The Bureau of Vocational Education, Pennsylvania Department of Education, Harrisburg, Pennsylvania, and the Department of Agricultural Education, The Pennsylvania State University, University Park, Pennsylvania, for financial support for the development and field testing of the resource materials for this study.

2. Students, faculty, and administrators in the 20 Pennsylvania high schools and area vocational-technical schools who participated in the teaching experiment.

3. The panel of specialists who reviewed and revised the resource materials: Stanley Cassel, Cassel Greenhouses; Henry Givler, Vocational Consultant; Daniel Helwig, Lancaster County Area Vocational-Technical School; Gary Kreci, George Ball Company; Donald Mincemoyer, The Pennsylvania State University; Anthony Mikloiche, Lackawanna County Area Vocational-Technical School; Dennis Scanlon, University of Florida; and Richard Stinson, The Pennsylvania State University.

4. The George Ball Company, who provided 150 chrysanthemum cuttings and supplier's literature for each school in the study.

INTRODUCTION

Abstract

Keeping records of "hands-on" experiences has provided high school vocational agriculture students with a systematic approach to developing skills for employment. There is a need for a greenhouse-production record book for vocational agriculture students preparing for careers in the greenhouse industry. In this study, a greenhouse-production record book and a unit of instruction for growing potted chrysanthemums were developed and field tested. Students in the study had the opportunity to grow potted chrysanthemums, a commonly grown commercial greenhouse crop, in the school greenhouse.

The practice of providing "hands-on" or supervised experience in agriculture is not a new concept. With the passage of the Smith Hughes Act in 1917, supervised experience in agriculture on a farm became an accepted procedure for providing "hands-on" learning experiences. To supplement classroom instruction, high school vocational agriculture students were required to keep records of the practices that were used on a farm.

Under the Vocational Education Act of 1963, vocational agriculture programs were broadened to include off-farm agricultural occupations. The Vocational Amendments of 1968 increased support for vocational education and consolidated previous legislation. By this time, high school students studying vocational agriculture were selecting new careers in forestry, natural resources, horticulture, and agriculture supplies and products as well as farming. The traditional "hands-on" experiences obtained by working on a farm no longer provided the skills needed for off-farm careers.

A greenhouse record book and a potted-chrysanthemum unit were developed to be used as the independent variables in this study. A potted-chrysanthemum scoresheet and a potted-chrysanthemum test were developed to measure the achievement of the students. The mean crop quality scores and mean test scores were the dependent variables. All the resources developed for the study were reviewed by a panel of specialists, field tested by teachers, and revised before the experimental study was initiated.

The design selected for the study was a modified posttest-only control group design. The population for this study included selected high schools and area vocational-technical schools with horticulture departments in Central and Eastern Pennsylvania. Twenty-eight schools were contacted by telephone to obtain 20 schools who met the criteria. All 20 schools were used in the study; the schools were randomly assigned to the levels of the treatment. Five classes received the greenhouse record book coupled with the potted-chrysanthemum unit (X_1); five classes received only the greenhouse record book (X_2); five classes received only the potted-chrysanthemum unit (X_3); and five classes received the teachers' own instructional materials (X_4).

The principal conclusion of the investigation was that the potted-chrysanthemum unit was effective in promoting cognitive learning about potted-chrysanthemum production. The results supported the belief that the students who received the potted-chrysanthemum unit would score higher on a cognitive test than students who did not receive the potted-chrysanthemum unit. The potted-chrysanthemum unit and the greenhouse record book when used independently were effective in helping students to grow better quality potted chrysanthemums.

Background

Keeping records of "hands-on" experiences provides high school vocational agriculture students with a systematic approach to developing skills for employment. There is a need for a greenhouse-production record book for vocational agriculture students preparing for careers in the greenhouse industry. In this study a greenhouse-production record book and a unit of instruction for growing potted chrysanthemums were developed and field tested. Students in the study had the opportunity to grow potted chrysanthemums, a common commercial greenhouse crop, in the school greenhouse.

The practice of providing "hands-on" or supervised experience in agriculture is not a new concept. With the passage of the Smith Hughes Act in 1917, supervised experience in agriculture on a farm became an accepted procedure for providing "hands-on" learning experiences. To supplement classroom instruction, high school vocational agriculture students were required to keep records of the practices that were used on a farm.

Under the Vocational Education Act of 1963, vocational agriculture programs were broadened to include off-farm agricultural occupations. The Vocational Amendments of 1968 increased support for vocational education and consolidated previous legislation. By this time, high school students studying vocational agriculture were selecting new careers in forestry, natural resources, horticulture, and agriculture supplies and products as well as farming. The traditional "hands-on" experiences obtained by working on a farm no longer provided the skills needed for these careers.

The primary purpose of this study was to develop and field test a greenhouse record book. A secondary purpose of the study was to field test an accompanying unit of instruction on potted chrysanthemums in school greenhouses in Pennsylvania vocational agriculture programs. The relationship between use of the record book, the use of the unit, and student achievement in producing a crop and in cognitive development was examined.

METHOD

Hypotheses

1. There is no significant difference in mean achievement scores of students receiving the greenhouse record book coupled with the potted-chrysanthemum unit (X_1) and students receiving the greenhouse record book only (X_2) as measured by a cognitive test.

2. There is no significant difference in mean achievement scores of students receiving the greenhouse record book coupled with the potted-chrysanthemum unit (X_1) and students receiving the potted-chrysanthemum unit only (X_3) as measured by a cognitive test.

3. There is no significant difference in mean achievement scores of students receiving the greenhouse record book coupled with the potted-chrysanthemum unit (X_1) and students receiving the teachers' own instructional resources (X_4) as measured by a cognitive test.

4. There is no significant difference in mean achievement scores of students receiving the greenhouse record book (X_2) and students receiving the potted-chrysanthemum unit (X_3) as measured by a cognitive test.

5. There is no significant difference in mean achievement scores of students receiving the greenhouse record book (X_2) and students receiving the teachers' own instructional resources (X_4) as measured by a cognitive test.

6. There is no significant difference in mean achievement scores of students receiving the potted-chrysanthemum unit (X_3) and students receiving the teachers' own instructional materials (X_4) as measured by a cognitive test.

7. There is no significant difference in mean crop quality scores of students receiving the greenhouse record book coupled with the potted-chrysanthemum unit (X_1) and students receiving the greenhouse record book only (X_2) as measured on a crop-quality score-sheet.

8. There is no significant difference in mean crop quality scores of students receiving the greenhcuse record book coupled with the potted-chrysanthemum unit (X_1) and students receiving the potted-chrysanthemum unit only (X_3) as measured on a crop-quality score-sheet.

9. There is no significant difference in mean crop quality scores of students receiving the greenhouse record book coupled with the potted-chrysanthemum unit (X_1) and students receiving the teachers' own instructional resources (X_4) as measured on a crop-quality scoresheet.

10. There is no significant difference in mean crop quality scores of students receiving the greenhouse record book (X_2) and students receiving the potted-chrysanthemum unit (X_3) as measured on a crop-quality scoresheet.

11. There is no significant difference in mean crop quality scores of students receiving the greenhouse record book (X_2) and students receiving the teachers' own instructional resources (X_4) as measured on a crop-quality scoresheet.

12. There is no significant difference in mean crop quality scores of students receiving the potted-chrysanthemum unit (X_3) and students receiving the teachers' own instructional materials (X_4) as measured on a crop-quality scoresheet.

Summary of the Development of Resource Materials for the Study

A greenhouse record book and a potted-chrysanthemum unit were developed to be used as the independent variables. A potted-chrysanthemum scoresheet and a potted-chrysanthemum test were developed to measure the achievement of the students. The mean crop quality scores and mean test scores were the dependent variables. All resources developed for the study were reviewed by a panel of specialists, field tested by teachers, and revised before the experiment was initiated.

Summary of the Experimental Design

The design selected for the study was a modified posttest-only control group design. The population for this study included the high school and area vocational-technical schools with horticulture departments in Central and Eastern Pennsylvania who met the following criteria:

1. Teachers indicated a willingness to participate in the study and to grow potted chrysanthemums during September, October and November 1979.

2. The teachers had grown chrysanthemums at least once before the study.

3. The teachers indicated that they had facilities and supplies to grow potted chrysanthemums.

Twenty-eight schools were contacted by telephone to obtain twenty schools who met the criteria. All twenty schools were used in the study; the schools were randomly assigned to the levels of the treatment. Five classes received the greenhouse record book coupled with the potted-chrysanthemum unit (X_1); five classes received only the greenhouse record book (X_2); five classes received only the potted-chrysanthemum unit (X_3); and five classes received the teachers' own instructional materials (X_4).

The design used in this study is shown diagrammatically as follows:

R	X_1	O_1	O_2	5 classes
R	X_2	O_3	O_4	5 classes
R	X_3	O_5	O_6	5 classes
R	X_4	O_7	O_8	5 classes

The symbols represent the following:

R - represents random assignment of classes to one of the levels of the treatment.
X_1 - represents the students receiving the greenhouse record book and the potted-chrysanthemum unit.
X_2 - represents the students receiving the greenhouse record book.
X_3 - represents the students receiving the potted-chrysanthemum unit.
X_4 - represents the students receiving the teachers' own instructional materials.
O_1, O_3, O_5 and O_7 - represent the cognitive posttest scores.
O_2, O_4, O_6 and O_8 - represent the chrysanthemum quality scores.

The active independent variable was the resource materials. There were four levels of the active independent variable:

1. Instruction using the greenhouse record book and the potted-chrysanthemum unit, in addition to the supplier's literature and the chrysanthemum plants.

2. Instruction using the greenhouse record book, in addition to the supplier's literature and the chrysanthemum plants.

3. Instruction using the potted-chrysanthemum unit, in addition to the supplier's literature and the chrysanthemum plants.

4. Instruction using the teachers' own resource materials, in addition to the supplier's literature and the chrysanthemum plants.

Each group of teachers in the study was given in-service instruction about the use of the resource materials, the use of the supplier's literature and the procedure for their involvement in the study. After the in-service workshops, the teachers taught their students the unit of instruction and grew the potted chrysanthemums. The dependent variables in the study were (1) student achievement scores on a cognitive test, and (2) student achievement scores on the potted-chrysanthemum scoresheet.

ANALYSIS

Summary

Hypotheses 1 through 6 compared all pair-wise contrasts for the adjusted mean test scores using grade as a covariate. Hypotheses 3, 4 and 6 were rejected which indicated that students receiving the potted-chrysanthemum unit scored higher on the test than students who did not receive the unit.

t-statistics for all Pair-Wise Contrasts for the Adjusted Mean Test Scores with Grade as a Covariate.

Treatment Comparison	Mean Scores Compared	t-statistic	Hypotheses
$X_1 - X_2$	25.88 - 23.55	2.34	1 - not rejected
$X_1 - X_3$	25.88 - 26.16	.33	2 - not rejected
$X_1 - X_4$	25.88 - 22.95	3.10*	3 - rejected
$X_2 - X_3$	23.55 - 26.16	2.68*	4 - rejected
$X_2 - X_4$	23.55 - 22.95	.57	5 - not rejected
$X_3 - X_4$	26.16 - 22.95	3.48*	6 - rejected

*$p \leq .05$

Hypotheses 7 through 12 compared all pair-wise contrasts for the adjusted mean quality scores using grade as a covariate. Hypotheses 7, 8, 11 and 12 were rejected which seemed to indicate that students receiving the greenhouse record book or the potted-chrysanthemum unit independently scored higher on the quality of their potted chrysanthemums than students who did not receive the book or unit independently.

t-statistic for all Pair-Wise Contrasts for the Adjusted Mean Quality Scores with Grade as a Covariate.

Treatment Comparison	Mean Scores Compared	t-statistic	Hypotheses
$X_1 - X_2$	2.88 - 3.47	3.88*	7 - rejected
$X_1 - X_3$	2.88 - 3.50	4.80*	8 - rejected
$X_1 - X_4$	2.88 - 2.59	2.01	9 - not rejected
$X_2 - X_3$	3.47 - 3.50	.20	10 - not rejected
$X_2 - X_4$	3.47 - 2.59	5.43*	11 - rejected
$X_3 - X_4$	3.50 - 2.59	6.46*	12 - rejected

*$p \leq .05$

CONCLUSIONS AND RECOMMENDATIONS

Findings and Conclusions

The findings derived from this study are presented in the same order as the hypotheses.

1. Hypothesis 1 was not rejected. There was no significant difference in mean achievement scores of the students receiving the greenhouse record book coupled with the potted-chrysanthemum unit and students receiving the greenhouse record book as measured by a cognitive test.

2. Hypothesis 2 was not rejected. There was no significant difference in mean achievement scores of students receiving the greenhouse record book coupled with the potted-chrysanthemum unit and students receiving the potted-chrysanthemum unit as measured by a cognitive test.

3. Hypothesis 3 was rejected. The mean achievement score of students receiving the greenhouse record book coupled with the potted-chrysanthemum unit was significantly higher than the mean achievement score of students receiving the teachers' own instructional resources. The greenhouse record book coupled with the potted-chrysanthemum unit appeared to be more effective than the teachers' own resources as a means of promoting cognitive learning about potted-chrysanthemum production. Since all treatments experienced the same effects of history and maturation and since regression and selection effects would be represented equally, it was concluded that the greenhouse record book coupled with the potted-chrysanthemum unit was effective in facilitating cognitive learning.

4. Hypothesis 4 was rejected. The mean achievement score of students receiving the potted-chrysanthemum unit was significantly higher than the mean achievement score of students receiving the greenhouse record book. The potted-chrysanthemum unit appeared to be more effective than the greenhouse record book as a means of promoting cognitive learning about potted chrysanthemums. Since the experimental design controls most threats to internal validity, it was concluded that the potted-chrysanthemum unit was effective in facilitating cognitive learning.

5. Hypothesis 5 was not rejected. There was no significant difference in mean achievement scores of students receiving the greenhouse record book and students receiving the teachers' own instructional materials as measured by a cognitive test.

6. Hypothesis 6 was rejected. The mean achievement score of students receiving the potted-chrysanthemum unit was significantly higher than the mean achievement score of students receiving the teachers' own instructional resources. The potted-chrysanthemum unit appeared to be more effective than the teachers' own instructional resources in promoting cognitive learning. It was concluded that the potted-chrysanthemum unit was effective in facilitating cognitive learning.

7. Hypothesis 7 was rejected. The mean crop-quality score of students receiving the greenhouse record book was significantly higher than the mean crop-quality scores of students receiving the greenhouse record book coupled with the potted-chrysanthemum unit.

8. Hypothesis 8 was rejected. The mean crop-quality score of students receiving the potted-chrysanthemum unit was significantly higher than the mean crop-quality score of students receiving the greenhouse record book coupled with the potted-chrysanthemum unit.

9. Hypothesis 9 was not rejected. There was no significant difference in mean achievement scores of students receiving the greenhouse record book coupled with the potted-chrysanthemum unit and students receiving the teachers' own instructional resources as measured by a crop-quality scoresheet.

10. Hypothesis 10 was not rejected. There was no significant difference in mean achievement scores of students receiving the greenhouse record book and students receiving the potted-chrysanthemum unit as measured by a crop-quality scoresheet.

11. Hypothesis 11 was rejected. The mean crop-quality score of students receiving the greenhouse record book was significantly higher than the mean crop-quality score of students receiving the teachers' own instructional resources.

12. Hypothesis 12 was rejected. The mean crop-quality score of students receiving the potted-chrysanthemum unit was significantly higher than the mean crop-quality score of the students receiving the teachers' own instructional resources.

The principal conclusion of the investigation was that the potted-chrysanthemum unit was effective in promoting cognitive learning about potted-chrysanthemum production. The results supported the belief that the students who received the potted-chrysanthemum unit would score higher on a cognitive test than students who did not receive the potted-chrysanthemum unit.

The potted-chrysanthemum unit and the greenhouse record book when used independently seemed to be effective in helping students to grow better quality potted chrysanthemums.

Recommendations

Based on the findings and conclusions resulting from this study, the review of literature, and the experience of the investigator in conducting the study, the following recommendations are made:

1. Students growing greenhouse crops in the school greenhouse should receive an organized comprehensive instructional unit to promote cognitive learning. The results of this study and the review of literature indicated that students scored higher on cognitive tests when they used a carefully prepared instructional resource unit.

2. Teachers should consider the use of the greenhouse record book or unit of instruction independently to help students produce better quality potted chrysanthemums. Although the greenhouse record book coupled with the potted-chrysanthemum unit did not appear to significantly improve the students' performance in producing a better quality crop, the greenhouse record book or potted-chrysanthemum unit when used independently seemed to help the students produce better quality chrysanthemums.

3. Teachers should encourage students to keep accurate cultural and financial records. Teachers who provide their students with supervised occupational experiences in the school greenhouse may find the greenhouse record book a valuable educational resource.

4. Agricultural educators should provide instruction in the use of the greenhouse record book to undergraduates in the pre-service program in the Agricultural Education Department at The Pennsylvania State University.

5. The greenhouse record book should be used by the state administrators of vocational agriculture to select the outstanding greenhouse projects in Pennsylvania.

APPENDIX A

GREENHOUSE PRODUCTION RECORD BOOK

AGDEX 821/952

GREENHOUSE PRODUCTION RECORD BOOK

The Pennsylvania State University
Department of Agricultural Education
Instructional Materials Service
University Park, Pennsylvania 16802

Name _____ Grade _____

School _____ County _____

Teacher _____ Crop _____

Year _____ Beginning Date _____ Ending Date _____

Introduction

The Greenhouse Production Record Book was developed by Kenneth B. Rhodes as part of a project conducted by the Department of Agricultural Education, The Pennsylvania State University, University Park, Pa. 16802 and the Bureau of Vocational Education, Pennsylvania Department of Education, Harrisburg, Pa. 17126.

The record book was reviewed and revised by a panel of specialists (Stan Cassel, Cassel Greenhouses; Henry Givler, Vocational Consultant; Daniel Helwig, Lancaster County AVTS; Gary Kreci, George Ball Co.; Donald Mincemoyer, The Pennsylvania State University; Anthony Mikloiche, Lackawanna County AVTS; Dennis Scanlon, University of Florida; and Richard Stinson, The Pennsylvania State University).

The record book was field tested by teachers of horticulture in Pennsylvania. It is designed to provide a record of approved practices, expenses, receipts and labor. The record book is a single enterprise record-keeping system.

Keeping complete, accurate and legible production records is an important part of a successful greenhouse production course. This book provides the basis for analyzing each greenhouse crop that is grown as a part of the total greenhouse production schedule.

TABLE OF CONTENTS

With your instructor's help, fill in the dates at the left side of the Table of Contents. By filling in as many dates as possible while planning for the crop, the grower will have a guide to performing and recording critical cultural practices. The grower should refer to this page often while growing the crop.

Date		Page
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_____	B. RECEIVING, PROPAGATING AND HANDLING OF IMMATURE PLANTS	2
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A. PURCHASING AND RECEIVING RECORD

Crop _____ Total Plants Ordered _____

Check how plants will be grown: Container ____ Bench ____

Varieties	Total Plants Ordered by Varieties

Supplier Name _____ Salesperson _____

Order Placed _____ (date) Ordered by: (check one)

____ Telephone
____ Salesperson visit
____ Mail
____ Picked up

Confirmation Received _____ (date) To be Shipped _____ (date)

Type of Carrier _____

Shipment Received _____ (date)

Comments after Inspection _____

Date Received _____ Date Planted _____

How were plants stored from receiving date to planting time? _____

B. RECEIVING, PROPAGATING AND HANDLING OF IMMATURE PLANTS

1. RECEIVING PLANTS

The following list includes the way you will receive plant material. Check one of the following to indicate the kind of plant material received.

____ a. Seed (complete pages 2 and 3)

____ b. Stock Plants (complete pages 4 and 5)

____ c. Bulbs, Tubers or Corms (complete pages 6 and 7)

____ d. Cuttings (complete section 'd' on page 8)

____ e. Super Seedlings (complete section 'e' on page 8)

____ f. Prefinished Plants (complete section 'f' on page 8)

2. PROPAGATING AND HANDLING OF PLANTS

After checking the kind of plant material received, find the corresponding letter under this heading and fill out the information requested.

a. Seed Propagation (fill out this section if you checked [a. Seed] above.)

Type of medium _____

Type of container _____

Depth of planting _____

Seed covered or uncovered _____

Temperature:

_____ Medium

_____ Air

Location:

_____ Mist bench

_____ With heat

_____ Without heat

_____ Growth chamber

_____ Other location

Describe _____

_____

_____

Light:

_____ Artificial

_____ Natural

_____ Combination

_____ Foot candles

_____ Duration

SEEDING CHART (fill out this chart if crop is propagated by seed.)

	VARIETIES									
Number of Seeds Seeded										
Seeding (date)										
First Sign of Germination (date)										
Percent Germination[1]										
Removal of Covers (date)										
Ready for Transplant (date)										
Actual Transplant (date)										
Number of Seedlings Transplanted										
Propagation Rating of Varieties: Poor, Good, Excellent										
Number of Seedlings Two Weeks After Transplanting										
Percent Viable Two Weeks After Planting[2]										

[1] $\frac{\text{No. of Seeds Germinated}}{\text{No. of Seeds Planted}}$ = Percent Germination

[2] $\frac{\text{Number of Seedlings Two Weeks After Transplanting}}{\text{Number of Seedlings Transplanted}}$ = Percent Viable

b. Stock Plants (fill out this section if you checked [b. Stock Plants] above.)

Stock plant was obtained from:

____ Commercial firm producing stock plants
____ Local greenhouse
____ Plants grown at home
____ School greenhouse

Inspection of stock plant:

____ Plant appears healthy
____ Plant shows general poor vigor
____ Insects and/or disease present
____ Plant shows mechanical damage

Describe planned stock plant culture:

____ Age of stock plant when received
____ Age of stock plant when first cuttings will be taken

Repotting procedure _____

_____

Fertility practice _____

_____

Disease and insect control _____

_____

Other cultural practices _____

_____

Cutting propagation from stock plant:

Type of cutting (softwood/semi-hard/hard) _____

Type of container _____

Approximate size of cutting _____ inches

Type of root hormone _____

Temperature:

_____ Medium
_____ Air

Location:

_____ Mist bench
_____ With heat
_____ Without heat
_____ Growth chamber

Light:

_____ Artificial
_____ Natural
_____ Combination
_____ Foot candles
_____ Duration

CUTTINGS PROPAGATED FROM STOCK PLANTS

	VARIETIES									
Total Cuttings										
Approximate Cuttings per Plant										
Callus Formation (date)										
Root Formation (date)										
Number of Cuttings Rooted										
Percent Rooted[1]										
Planting (date)										
No. of Cuttings Surviving after One Week Planting										

[1] $\frac{\text{No. of Cuttings Rooted}}{\text{Total Cuttings Stuck}}$ = Percent Rooted

c. Bulbs, Tubers or Corms (fill out this section only if you checked [c. Bulbs, Tubers or Corms] above.)

Cooling period needed ____ Cooling period not needed ____

If precooled, check here ____ Planting medium used _____

Description of facilities for cold storage (kind of storage, temperature range available, size, etc.).

_____

_____

_____

Describe cover and handling if outside cold storage is used.

_____

_____

_____

Describe temperature control when using refrigeration for cooling.

Variety	Dates	Temperatures	Number of Days at Desired Temperature

BULBS, TUBERS OR CORMS (fill out this chart if cold treatment is used.)

	VARIETIES									
Total Plants										
Number of Plants per Container										
Container — Size										
Container — Number										
Potted (date)										
Put into Cold Storage (date)										
Taken out of Cold Storage (date)										
Weeks of Cold Storage — Minimum										
Weeks of Cold Storage — Maximum										
Record No. of Days to Force (Bulb Manual)										
Record Actual Days Required to Force										

d. Cuttings (fill out this section if you checked [d. Cuttings] above.)

Callused cuttings ____ Bare rooted cuttings ____

Container potted cuttings ____

Varieties	No. of Cuttings Received

e. Super Seedlings--Seedling Transplants (fill out this section if you checked [e. Super Seedlings] above.)

Varieties	No. of Seedlings Received

f. Prefinished Plants--Plants to be Forced (fill out this section if you checked [f. Prefinished Plants] above.)

Varieties	No. of Plants Received

C. APPROVED PRACTICES FOR GROWING GREENHOUSE CROPS

Fill out all information in this part of the book that applies to your crop. You should record information for all sections 1 to 10.

1. GROWING MEDIUM (description should include soil test recommendations):

_____

_____

_____

_____

_____

_____

_____

_____

Plant Date _____ Market Date _____

2. POTTING:

Variety	Total No. of Plants	Size of Pot	Plants per Pot	Total Pots

Describe special cultural techniques in planting or potting:

_____

_____

_____

_____

_____

_____

3. FERTILITY PLAN (refer to soil test and make certain all suggested practices were implemented during soil preparation):

Stage of Growth	Fertilizer Grade (Formula)	Timing of Application	Proportioning Ratio	Ounces of Concentrate Gallons of Stock Solution	PPM

Describe use of any slow release material incorporated in soil (formula, release duration, quantity per soil volume).

4. PINCHING:

Pinch Date	Type of Pinch Hard or Soft	Number of Stems Pinched All or Half

5. REMOVAL OF SIDE SHOOTS--PRUNING (Describe which shoots will be left on the plant to develop):

6. DISBUDDING (Describe which buds will be left on the plant to develop):

7. LIGHT REQUIREMENTS:

Is the crop photoperiodic? ____ Yes ____ No

Is the crop . . . ____ long day
____ day neutral
____ short day

a. Intensity

Describe light intensity required by plants. Describe any special screening of light used.

_____

_____

_____

	Date	Type of Day (Clear, bright overcast, raining)	Time of Day	Light (Measured in foot candles)
Planting	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
Marketing	_____	_____	_____	_____

b. Photoperiod

Description of lighting and shading facilities:

_____

_____

_____

_____

_____ Lights on (date) _____ Shade on (date)

_____ Lights off (date) _____ Shade off (date)

_____ Time turned on _____ Time put on

_____ Time turned off _____ Time taken off

_____ Hours per night _____ Hours per night

8. TEMPERATURE CONTROL:

a. Make a plan for controlling temperature

Stage of Development	Date	Desirable Night Temperature	Desirable Dull Day Temperature	Desirable Bright Day Temperature
Planting time				
Market time				

b. Actual temperatures recorded while crop is being grown (record temperatures taken at plant height)

Stage of Development	Date	Actual Night Temperature	Actual Day Temperature	Specify (Dull or bright day)
Planting time				
Market time				

9. WATERING:

Check type of watering system used: ____ Hand ____ Automatic

a. Describe hand or automatic equipment used:

_____

_____

_____

b. Describe plant's need for water:

_____

_____

_____

c. Describe your plan for controlling watering:

_____

_____

_____

10. REGULATING GROWTH (check method to be used):

____ Proper timing ____ Limit Water ____ Chemical control

If chemical control is used, fill in the following information:

No. of Plants Treated	Chemical Used	Foliar or Drench	Percent Solution	No. of Ounces per Pot

11. PESTICIDE CONTROL:

a. List troublesome insects, mites or rodents which may attack plants.

List of Pests	Recommended Cultural Control	Recommended Chemical Control

b. List troublesome diseases which may attack plants.

List of Diseases	Recommended Cultural Control	Recommended Chemical Control

D. GREENHOUSE OBSERVATIONS AND RECOMMENDATIONS

Student must complete four (4) observations and four (4) recommendations during the production of this crop. Student should complete observation page by going into greenhouse and carefully examining the crop. After completing observation student will complete recommendation sheet by returning to the classroom and carefully making recommendations based upon the review of literature and the observation. Careful adjustments to crop program will result in improving plant quality. Complete the following pages (14-21) at critical growth stages of the crop.

Observation No. 1 Date _____

Crop _____ Observer _____

Plant date _____ Pinch date _____ Market date _____

General appearance (color, size, form, blemishes, branching):

Describe plant damage (insect, temperature, soluble salts, disease, chemical insecticide, mechanical; area of plant affected: leaves, stems, flowers, roots):

List insects present (describe severity of infestation):

Check root development (describe root appearance: white, well developed, dark, evidence of root rot, examine root tips):

Describe maturity in relation to market date (size bud development, bract size, color):

Soil conditions (wet, dry, compact, friable, weeds present, etc.):

Spacing of plant material:

Other comments:

Complete this page immediately following your observations recorded on the previous page.

Recommendation No. 1 Date _____

Crop _____ Grower _____

Plant date _____ Pinch date _____ Market date _____

Watering practices (morning, more frequent, less frequent, device used):

Fertilization practices (amount, grade trace elements, leach):

Insect control suggested (spray, fog, material suggested):

Disease control practices (drench, spray, cultural, sterilization):

Temperature adjustment (suggest method of adjusting):

Lighting or shading practices:

CO_2 adjustment:

Pinch, disbud, remove laterals, harvest:

Instructor comments:

Date Reviewed with Instructor _____

Instructor's Signature _____

Observation No. 2 Date _____

Crop _____ Observer _____

Plant date _____ Pinch date _____ Market date _____

General appearance (color, size, form, blemishes, branching):

Describe plant damage (insect, temperature, soluble salts, disease, chemical insecticide, mechanical; area of plant affected: leaves, stems, flowers, roots):

List insects present (describe severity of infestation):

Check root development (describe root appearance: white, well developed, dark, evidence of root rot, examine root tips):

Describe maturity in relation to market date (size bud development, bract size, color):

Soil conditions (wet, dry, compact, friable, weeds present, etc.):

Spacing of plant material:

Other comments:

Complete this page immediately following your observations recorded on the previous page.

Recommendation No. 2 Date _____

Crop _____ Grower _____

Plant date _____ Pinch date _____ Market date _____

Watering practices (morning, more frequent, less frequent, device used):

Fertilization practices (amount, grade trace elements, leach):

Insect control suggested (spray, fog, material suggested):

Disease control practices (drench, spray, cultural, sterilization):

Temperature adjustment (suggest method of adjusting):

Lighting or shading practices:

CO_2 adjustment:

Pinch, disbud, remove laterals, harvest:

Instructor comments:

Date Reviewed with Instructor _____

Instructor's Signature _____

Observation No. 3 Date _____

Crop _____ Observer _____

Plant date _____ Pinch date _____ Market date _____

General appearance (color, size, form, blemishes, branching):

Describe plant damage (insect, temperature, soluble salts, disease, chemical insecticide, mechanical; area of plant affected: leaves, stems, flowers, roots):

List insects present (describe severity of infestation):

Check root development (describe root appearance: white, well developed, dark, evidence of root rot, examine root tips):

Describe maturity in relation to market date (size bud development, bract size, color):

Soil conditions (set, dry, compact, friable, weeds present, etc.):

Spacing of plant material:

Other comments:

Complete this page immediately following your observations recorded on the previous page.

Recommendation No. 3 Date _____

Crop _____ Grower _____

Plant date _____ Pinch date _____ Market date _____

Watering practices (morning, more frequent, less frequent, device used):

Fertilization practices (amount, grade trace elements, leach):

Insect control suggested (spray, fog, material suggested):

Disease control practices (drench, spray, cultural, sterilization):

Temperature adjustment (suggest method of adjusting):

Lighting or shading practices:

CO_2 adjustment:

Pinch, disbud, remove laterals, harvest:

Instructor comments:

Date Reviewed with Instructor _____

Instructor's Signature _____

Observation No. 4 Date _____

Crop _____ Observer _____

Plant date _____ Pinch date _____ Market date _____

General appearance (color, size, form, blemishes, branching):

Describe plant damage (insect, temperature, soluble salts, disease, chemical insecticide, mechanical; area of plant affected: leaves, stems, flowers, roots):

List insects present (describe severity of infestation):

Check root development (describe root appearance: white, well developed, dark, evidence of root rot, examine root tips):

Describe maturity in relation to market date (size bud development, bract size, color):

Soil conditions (wet, dry, compact, friable, weeds present, etc.):

Spacing of plant material:

Other comments:

Complete this page immediately following your observations recorded on the previous page.

Recommendation No. 4 Date _____

Crop _____ Grower _____

Plant date _____ Pinch date _____ Market date _____

Watering practices (morning, more frequent, less frequent, device used):

Fertilization practices (amount, grade trace elements, leach):

Insect control suggested (spray, fog, material suggested):

Disease control practices (drench, spray, cultural, sterilization):

Temperature adjustment (suggest method of adjusting):

Lighting or shading practices:

CO_2 adjustment:

Pinch, disbud, remove laterials, harvest:

Instructor comments:

Date Reviewed with Instructor _____

Instructor's Signature _____

E. GREENHOUSE CROP BUDGET

This budget should be developed soon after selecting a crop to be grown. The budget should serve as a guide to costs as well as expected receipts.

RECEIPTS	Amount	Price per Unit	Total Value
Plants or flowers marketed			
Plants or flowers used			
Other receipts			
	Total Estimated Receipts		

EXPENSES	Amount	Price per Unit	Total Value
Value of unpurchased plant material			
Soil mix ($1.50/cu.ft.) 1 cu.ft. will fill 20, 6" pots			
Plant material cost			
Supplies: containers			
fertilizer			
insecticides			
fungicides			
growth regulator			
other:			
Fuel cost (10% of total estimated receipts)			
Overhead (depreciation, insurance, etc.; 6% of total estimated receipts)			
Labor costs (25% of total estimated receipts)			
Marketing costs (10% of total estimated receipts)			
	Total Estimated Expenses		

ESTIMATED LABOR/MANAGEMENT INCOME (Receipts - Expenses) _____

F. GOALS STATED IN RELATION TO EFFICIENCY*

Crop _____

	Average	Superior	Student Achievement
1. Percent marketed			
2. No. of pots produced or No. of flowers cut/100 sq.ft. of bench			
3. No. of flowers per pot			
Size of pot _____			
_____			
_____			
_____			
_____			
_____			
_____			
4. Height or length of stem			
5. Marketed at predetermined week (%)			
6. Flower quality			
7. Foliage color and flower color			
8. Unblemished (%)			

*Supervised Occupational Experience Record Forms for Ornamental Horticulture, Department of Agricultural Education, The Pennsylvania State University, University Park, Pa. 16802. This reference is a guide to goals and efficiency.

G. EXPENSES

1. SUPPLIES FOR GREENHOUSE CROP

Include in this record actual cost for supplies (seed, cuttings, stock plants, bulbs, seedlings, fertilizers, soil mix, containers, chemicals) and other materials used. Include only materials used.

Date	Supply Used	Amount	Per Unit	Total Cost

1. SUPPLIES FOR GREENHOUSE CROP (continued)

Date	Supply Used	Amount	Price Per Unit	Total Cost

2. VALUE OF UNPURCHASED PLANT MATERIAL USED

Include only unpurchased plant material that will be used to propagate this crop. (Value unpurchased plant material at current supplier prices.)

Date	Supply Used	Amount	Price Per Unit	Total Value
	2. Total Value of Unpurchased Plant Material Used			

3. FUEL COSTS

Calculate actual fuel costs for the crop if possible. If you cannot calculate actual fuel costs, use this estimate. Fuel cost is equal to 10% of the market value of an excellent quality crop that is marketed.

*Total Receipts x 10% = Fuel Costs

_____ x .10 = _____

Total Fuel Costs _____

4. OVERHEAD

a. Calculate actual fixed costs (depreciation, insurance, etc.) for the crop if possible. If you cannot calculate actual overhead costs, use this estimate. Fixed costs are equal to 5% of the market value of an excellent quality crop that is marketed.

*Total Receipts x 5% = Fixed Costs

_____ x .05 = _____

b. Interest on investment 1% per month

Cost of Supplies (1) x 1% x months = Interest on Investment

_____ x .01 x _____ = _____

Fixed Cost + Interest on Investment = Total Overhead Cost

_____ + _____ = _____

(a + b = total overhead)

Total Overhead Costs _____

5. COST OF MARKETING

Calculate actual cost of marketing if possible. If you cannot calculate actual marketing costs, use this estimate. Marketing costs are equal to 10% of the market value of an excellent quality crop that is marketed.

*Total Receipts x 10% = Marketing Costs

_____ x .10 = _____

Total Marketing Costs _____

*If the crop marketed was less than excellent in terms of quality and quantity, adjust the total receipts upward to reflect the market value of an excellent crop.

6. OTHER EXPENSES

	Total Value
4. Total for Other Expenses	

SUMMARY OF EXPENSES

1. Total Supplies $ _____
2. Total Value of Unpurchased Plant Material Used $ _____
3. Total Fuel Costs $ _____
4. Total Overhead Costs $ _____
5. Total Cost of Marketing $ _____
6. Other Expenses $ _____

H. LABOR RECORD AND MACHINERY USE RECORD

Record all unpaid labor and machinery time used to produce crop.

Date	Tasks Performed	Grower	Assistant Grower	Assistant Grower	Total Grower Hours	Machine Hours
	Total Hours for Page 29					

H. LABOR RECORD AND MACHINERY USE RECORD (continued)

Date	Tasks Performed	Grower	Assistant Grower	Assistant Grower	Total Grower Hours	Machine Hours

H. LABOR RECORD AND MACHINERY USE RECORD (continued)

Date	Tasks Performed	Grower	Assistant Grower	Assistant Grower	Total Grower Hours	Machine Hours

H. LABOR RECORD AND MACHINERY USE RECORD (continued)

Date	Tasks Performed	Grower	Assistant Grower	Assistant Grower	Total Grower Hours	Machine Hours

H. LABOR RECORD AND MACHINERY USE RECORD (continued)

Date	Tasks Performed	Grower	Assistant Grower	Assistant Grower	Total Grower Hours	Machine Hours

H. LABOR RECORD AND MACHINERY USE RECORD (continued)

Date	Tasks Performed	Grower	Assistant Grower	Assistant Grower	Total Grower Hours	Machine Hours

I. RECEIPTS

1. GREENHOUSE PRODUCTS MARKETED (list all plants marketed)

Date	Greenhouse Product Marketed	Amount	Price per Unit	Total Value

2. GREENHOUSE PRODUCTS USED FOR DISPLAY AND NOT MARKETED

Credit at the current market price all products used for display, advertising, and for the department.

Date	Greenhouse Products (purpose of product--adv., display, etc.)	Amount	Price per Unit	Total Value
	2. Total Value of Products Used			

3. VALUE OF PRODUCTS KEPT FOR FUTURE USE

Include only plant material kept for future use at the end of the crop period. No supply items should be included.

Date	Plant Material	Amount	Price per Unit	Total Value
	3. Total Value of Products Kept for Future Use			

SUMMARY OF RECEIPTS

1. Total Value of Plants Marketed $ _____
2. Total Value of Products Used $ _____
3. Total Value of Products Kept for Future Use $ _____

TOTAL RECEIPTS $ _____

J. SUMMARY STATEMENT

Crop _____

1. Total Receipts - Total Expenses = Labor Income (return to labor and management)

   _____ - _____ = _____

2. Total Expenses ÷ Total Sq.Ft. of Bench = Cost per Sq.Ft. of Bench

   _____ ÷ _____ = _____

3. Total Receipts ÷ Total Sq.Ft. of Bench = Receipts per Sq.Ft. of Bench

   _____ ÷ _____ = _____

4. Labor Income ÷ Total Sq.Ft. of Bench x Percent of 1 year in the Bench = Return on Labor per Sq.Ft. of Bench per Year

   _____ ÷ _____ x _____ = _____

Special conditions affecting income:

1. _____

2. _____

3. _____

K. INSTRUCTOR'S INDIVIDUAL INSTRUCTION AND COMMENTS

Date	Recommendations and Comments of Instructor

L. SUPPLIERS OF GREENHOUSE PRODUCTS AND SERVICES

Salesman or Representative	Address	Telephone

M. PICTURE RECORD

Take several pictures, showing various stages of development from propagation to market. List dates pictures were taken.

APPENDIX B

POTTED CHRYSANTHEMUM EXAMINATION

POTTED CHRYSANTHEMUM EXAMINATION

Select the best answer for each of the questions. Mark your answer sheet by darkening the entire bubble beside the correct letter choice. Use a No. 2 pencil. Do not make stray marks on your answer sheet. Erase all corrections completely.

1. Potted chrysanthemums can be flowered for

   A. fall and spring sales
   B. any predetermined date
   C. fall
   D. spring

2. Chrysanthemums can be grown as

   A. potted plants
   B. garden plants
   C. cut flowers
   D. all of the above

3. Potted chrysanthemums displayed in the house can be expected to last about

   A. 1 week
   B. 2 weeks
   C. 4 weeks
   D. 5 weeks

4. The most popular potted chrysanthemum flower types are

   A. pompon, daisy and fuji
   B. decorative, pompon and fuji
   C. fuji, decorative and daisy
   D. daisy, pompon and decorative

5. The most popular color for chrysanthemums is

   A. yellow
   B. bronze
   C. white
   D. pink

6. Chrysanthemums are considered to be

   A. short day plants
   B. long day plants
   C. day neutral plants
   D. short and long day plants

7. Growing pot mums vegetatively requires exposure to

   A. short days
   B. long days
   C. short and long days
   D. neutral days

8. If pot mums are grown vegetatively for a long period of time, the chrysanthemums will

   A. flower early
   B. grow short
   C. grow tall
   D. not be affected

9. Days are naturally short enough to produce flowering from about

   A. May until July
   B. June to August
   C. September to March
   D. March to September

10. Artificial lighting is used to produce vegetative growth in chrysanthemums from about

   A. May until July
   B. June to August
   C. September to March
   D. March to September

11. The minimum light intensity needed to keep mums growing vegetatively is about

   A. 5 foot candles
   B. 10 foot candles
   C. 15 foot candles
   D. 20 foot candles

12. A common problem caused by pulling the black shade cloth over chrysanthemums too early in the day is increased

   A. growing time
   B. stem length
   C. heat build-up under the cloth
   D. heat build-up over the cloth

13. The term "week group" or "response group" refers to the number of weeks from the time

   A. short days are started until flowering
   B. lights are started until flowering
   C. long days are started until flowering
   D. plants are potted until flowering

14. Pinching chrysanthemums provides

A. more flowers
B. less flowers
C. no flowers
D. larger flowers

15. Chrysanthemums should be pinched when how much new growth has developed?

A. 3/4 inch
B. 1 inch
C. 1 1/2 inches
D. 2 inches

16. Soft pinching requires the removal of how much of the stem tip?

A. 1/4 inch or less
B. 1/2 to 3/4 inch
C. 1 to 1 1/2 inches
D. 1 1/2 to 2 inches

17. Growth retardants are used to prevent excessive height in certain varieties of chrysanthemums. Growth retardants are usually applied when new growth after pinching reaches about

A. 3/4 inch
B. 2 inches
C. 4 inches
D. 6 inches

18. Disbudding should be done

A. weekly over a three-week period
B. weekly over a six-week period
C. daily over a three-day period
D. daily over a seven-day period

19. Buds that are removed when they are too large may

A. increase flower size
B. decrease shelf life
C. damage the stem
D. increase shelf life

20. A disspray refers to a plant which has had

A. no buds removed
B. the lateral buds removed
C. the terminal bud removed
D. all the buds removed

21. A disbud refers to a plant that has had

A. no buds removed
B. the lateral buds removed
C. the terminal bud removed
D. all the buds removed

22. If the same greenhouse space is used to grow chrysanthemums year round, a grower can grow how many crops in a year?

A. 1
B. 2
C. 3
D. 4

23. Chrysanthemums that are spaced too closely on the bench frequently will produce plants that

A. are too short
B. are poorly shaped
C. flower late
D. do not flower

24. Plants can be spaced about 1 inch between pots during the

A. first week of growth
B. first 3 to 4 weeks of growth
C. first 5 to 6 weeks of growth
D. entire growth period of the crop

25. Cuttings that cannot be potted immediately upon receiving them should be placed in

A. a cooler at 45^{o}
B. a cooler at 28^{o}
C. the greenhouse in the shipping container
D. a bucket of cool water

26. The soil mixture for growing potted chrysanthemums should be

A. light to promote faster growth
B. heavy to promote better keeping quality
C. varied with the variety selected
D. uniform, porous, and well drained

27. Chrysanthemum cuttings should be planted

A. deeply to encourage strong root systems
B. shallowly to insure good root strength
C. at an angle to encourage good root growth
D. in dry soil to prevent disease

28. If cuttings wilt during the potting exercise, plants will

A. be delayed in growing time
B. not be affected
C. probably die
D. not respond to photo period

29. Chrysanthemums should be watered uniformly

A. on cloudy days or early in the morning to prevent burning of foliage
B. at the rate of one cup of water per pot per day
C. just after the plants begin to wilt
D. just before wilting begins

30. If plants are permitted to wilt

A. loss of size and vigor will be a result
B. plants will not be affected
C. root systems will be deeper and stronger
D. plants will be free from disease problems

31. To help prevent disease problems in chrysanthemums, watering should be done

A. on cloudy days
B. in the evening
C. in the morning on bright days
D. just after plants begin to wilt

32. Which is a sign of nutrient deficiency?

A. root system has reached the edge of the pot by pinching time
B. dark green foliage color
C. leaves are not expanding
D. buds are beginning to form

33. Which soil mixture will require more fertilizing?

A. heavy soil
B. soils high in perlite or vermiculite
C. soils high in organic material
D. soils that have not been tested

34. Chrysanthemums should be fertilized

A. once a month
B. once a week
C. every other watering
D. every watering

35. To prevent soluble salt build-up in the chrysanthemum pots

A. decrease frequency of fertilizing but increase quality of fertilizer applied
B. add osmocote at the time of potting
C. water less frequently
D. water until some water runs from the bottom of the pot

36. If a good fertility program has been maintained the fertilizer should be

A. stopped at the time of disbudding
B. increased at the time of flower formation
C. decreased one week before marketing
D. increased one week before marketing

37. Chrysanthemums require different temperatures at various stages of development. Chrysanthemums should be started

A. cool and finished warm
B. warm and finished cool
C. cool and finished cool
D. warm and finished warm

38. Temperatures greater than 85^{o} can cause

A. early flowering
B. late flowering
C. short compact vegetative growth
D. large leaves and flowers

39. To avoid uneven flowering of chrysanthemums the temperature during the first two weeks of short days should be

A. greater than 60^{o} and less than 65^{o}
B. less than 60^{o} and greater than 55^{o}
C. greater than 65^{o} and less than 85^{o}
D. less than 75^{o} and greater than 65^{o}

40. Finishing chrysanthemums cool

A. is not a good practice
B. may cause disease
C. may cause handling damage
D. intensifies color

41. An insecticide which is taken into the plant to provide a long lasting effect on insects is called

A. a dust
B. an aerosol
C. a spray
D. a systemic

42. Which of the following practices will help to prevent and control disease problems?

A. air movement, watering in the morning and starting plants from your own cuttings
B. watering in the morning, air movement, and using sterilized soil
C. using sterilized soil, starting plants from your own cuttings, and watering in the morning
D. starting plants from your own stock plants, using sterilized soil, and air movement

43. Chrysanthemums should be marketed when the

A. buds begin to show color
B. buds are the size of a nickel
C. flowers are one-half open
D. flowers are open full

44. Generally, cooler temperatures cause plants to

A. develop and grow slower
B. develop and grow faster
C. flower earlier
D. grow taller and thinner

45. Ventilation is necessary in a greenhouse to

A. regulate temperature
B. adjust the humidity
C. provide air movement
D. all of the above

46. The best way to determine when chrysanthemums need the grower's attention is

A. check your schedule
B. make a careful plan
C. observe the plants
D. consult a specialist

47. Greenhouse chrysanthemums are propagated by

A. stem tip cuttings
B. leaf-petiole cuttings
C. layering
D. seeds

48. A ten-week chrysanthemum cultivar can be produced in about

A. 9 weeks
B. 10 weeks
C. 12 weeks
D. 14 weeks

APPENDIX C

POTTED CHRYSANTHEMUM SCORESHEET

POTTED CHRYSANTHEMUM SCORESHEET
PART I

Student Name _____ School _____

Teacher _____

Number of cuttings planted ____

Number of plants finished ____

Directions: After measuring stem length, counting flowers and counting breaks, record the number of finished chrysanthemums that can be placed in the following categories.

Size: The plant should not be either too large or too small for the container. Measure plant height including the 4" pot and list number of plants in each category.	17"+	15" to 17"	12" to 14"	9" to 11"	9" or less
Number of Plants	____	____	____	____	____

Number of Flowers Open: The flowers should be uniform in development. Count and record number of plants with number of flowers uniformly open at market date.	Flowers Uniformly Open					
	5+	4	3	2	1	0
Number of Plants	____	____	____	____	____	____

Number of Strong Flower Supporting Breaks: Breaks should be thick and strong to promote stem strength. Count number of plants with number of strong breaks.	Number of Strong Breaks					
	5+	4	3	2	1	0
Number of Plants	____	____	____	____	____	____

POTTED CHRYSANTHEMUM SCORE CARD
PART II

Name _____ School _____ Teacher _____

No. of Cuttings Planted _____ No. of Mums Finished _____

Directions: Record the number of finished chrysanthemums rated excellent, very good, good, fair or poor in the space labeled "No. of Plants."

	Excellent	Very Good	Good	Fair	Poor
SIZE: Pot should be full enough to prevent the appearance of legginess. Pot should not appear too top-heavy. Pot and plant should measure between 12 to 14 inches high. No. of Plants					
FORM: Plant should appear symmetrical, compact, well furnished with foliage to the base and have a slightly rounded head, permitting maximum distribution of the flowers. No. of Plants					
FOLIAGE: Size and color of foliate should indicate good plant vigor. Aged foliage at the base of the plant should be at the minimum and dead or malformed leaves should be removed. Stems should be uniform in length and be strong enough to support the floral display. No. of Plants					
FLOWERS: Floral display should be spaced to permit development of display without over-crowding. Flower size should be uniform. The stage of development should be approaching full maturity without showing an open center. The flower color should be true to culture, fresh, bright and showing no sign of fading. No. of Plants			8		
BLEMISHES: Plant should show no evidence of nutritional deficiencies, disease and/or insect damage, spray residues or mechanical injury. There should be no evidence of recent or incomplete disbudding, broken peduncles, or wired or braced stems. No. of Plants					
TOTAL					